IOWA GYRATORY MIX DESIGN
(SuperPave)
FOR LOCAL AGENCIES

IMPLEMENTATION BULLETIN #5
April 2001

Pilot projects are a great way for Local Agencies to become acquainted with new technology. The Special Provision for utilizing Gyratory Mix Design is attached. It is an all-inclusive document containing the pertinent construction information necessary for a Gyratory pilot project. The Special Provision will be formally available for State bidding by the end of May. The document, as attached, can be used on projects that have already been let, or are currently in the bid letting process, through mutual benefit change orders with the contractors. Also, local agencies can place this Special Provision in their asphalt paving bid packages for future pilot projects.

The Local Implementation Team is currently developing a Design Guide to assist pavement designers with material and mixture selection. Until that Design Guide is released, please refer to the information that was given out in the winter training sessions if you are electing to have a pilot project utilizing Gyratory technology. If the aggregates for your contract have already been produced, make sure that they meet the specified Gyratory gradation criteria. If they do not, the change from Marshall to Gyratory can still be made; however, target gradation adjustments may be necessary to allow the utilization of those aggregates.

Since the initial study indicated that there would be no significant changes to the current mixes, the primary difference between the current and future practices will be only in the mix design methodology. A few local mixes may require minor adjustments. It is the intent of the implementation evaluation to NOT have a significant negative impact on the current local agency asphalt paving programs. The Implementation Plan will successfully apply Gyratory Mix Design Technology for all future asphalt paving in Iowa. This Implementation Plan will allow local agencies to continue to utilize their existing aggregates while applying Gyratory Mix Design criteria.

The Implementation team hopes to conduct several open house sessions this construction season to familiarize everyone with the technology. If you would like to showcase your asphalt project please feel free to contact any of the members of the Implementation Team. We will be happy to coordinate a demonstration session in your area.

The members of the Local Agency Implementation Team are:

Jon Ites, Buena Vista County Engineer
Todd Hagan, Madison County Engineer
Dave Paulson, Carroll County Engineer
Eric Schallert, City of Davenport
Ted Huisman, Cessford Construction Co.
Steve Sorenson, Fred Carlson Co.
Jim Zeigler, Rohlin Construction Co.
Mike Kvach, APAI
John Hinrichsen, Iowa DOT (Materials)
Brenda Boell, Iowa DOT (Local Systems)
Ed Engle, Iowa DOT (Materials Research)
Shane Tymkowicz, Iowa DOT (District 3)
Mike Heitzman, Iowa DOT (Materials)

Previous Bulletins are available on the Local Systems website at
www.dot.state.ia.us/local_systems/publications/publications.htm
under the heading “Iowa Gyratory Mix Design (SuperPave) Bulletins”. If you have any questions about this process please contact John Hinrichsen at the Central Materials Office at (515) 239-1601.

This is the fifth in a series of bulletins to be issued by the Implementation Team. If you desire more information about the Implementation Plan please contact Mike Heitzman at the Central Materials Office at (515) 239-1003.

Iowa Department of Transportation

SPECIAL PROVISION

FOR

LOCAL AGENCY ROUTE
GYRATORY MIX DESIGN CRITERIA
HOT MIX ASPHALT MIXTURES

April 2001

THE STANDARD SPECIFICATIONS ARE REPLACED BY THE FOLLOWING SPECIFICATION.

REPLACE all of Supplemental Specification 97055, Asphalt Cement Concrete Mixtures, with the following:

.01 DESCRIPTION
This work shall consist of mixture design, production, placement, and compaction of hot mix asphalt (HMA) mixture using proper quality control practices for the construction of surface, intermediate, or base course on a prepared subbase, base, or pavement, to the proper dimensions specified in the contract documents.

Terminology in this Special Provision was changed as follows:
asphalt cement concrete -- is now -- hot mix asphalt
asphalt cement -- is now -- asphalt binder
binder course -- is now -- intermediate course
Superpave mix design -- is now -- gyratory mix design
mix type and class -- is now -- ESAL level and mix size

.02 MATERIALS AND EQUIPMENT
Materials used in these mixtures shall meet the following requirements:

A. Asphalt Binder
The Performance Graded asphalt binder, PG XX –XX, will be specified in the contract documents to meet the climate, traffic, and pavement conditions. The asphalt binder shall meet the requirements in AASHTO MP1.

B. Aggregates

1. Individual Aggregates.

Virgin mineral aggregate shall meet the following requirements:

VIRGIN MINERAL AGGREGATES

Mixture	Aggregate Type	Aggregate Requirement
Base	B	Section 4126[(1)]
Intermediate and Surface	B	Section 4126
Intermediate and Surface	A	Section 4127

[(1)]When the size of mixture is not specified, 1/2" mixture shall be used.

When the frictional classification of the aggregate is specified, the contract documents will specify the amount, position in the structure, locations, and types specified. The aggregate shall be furnished from a source identified in Materials I.M. T-203 as having the specified frictional classification.

2. Blended Aggregates.

It is the Contractor's option to design mixes outside the "restricted zone."

The blended aggregates shall meet the following combined aggregate requirements.

Aggregate Gradation Control Points								
	Mix Size - Control Points (percent passing)							
	1 inch		3/4 inch		1/2 inch		3/8 inch	
Sieve Size	min.	max.	min.	max.	min.	max.	min.	max.
1 1/2 in	100							
1 in	90	100	100					
3/4 in		90	90	100	100			
1/2 in				90	90	100	100	
3/8 in						90	90	100
No. 4								90
No. 8	19	45	23	49	28	58	32	67
No. 200	1	7	2	8	2	10	2	10

Consensus Properties					
DESIGN ESALs (millions)	LAYER	MINIMUM PERCENT CRUSHED	FINE AGGR ANGULARITY	SAND EQUIVALENT	FLAT & ELONGATED
< 0.1	all	(1)	---	40	---
0.1 – 0.3	surface intermediate base	(1)	---	40	---
0.3 – 1.0	surface intermediate base	(1)	40 40 ---	40	10

(1) – The Contracting Authority will specify the target value.

C. Recycled Asphalt Pavement.

RAP shall be from a source designated in the contract documents, a certified stockpile, or unclassified reclaimed asphalt pavement furnished by the Contractor subject to the following limitations:

1. Designated RAP

When RAP is taken from a project, or is furnished by the Contracting Authority, the contract documents will indicate quantity of RAP expected to be available. The Contractor is responsible for salvaging this material unless otherwise specified in the contract documents. The RAP not used shall be incorporated into other parts of the project or placed in active stockpiles as directed in the contract documents.

The Contracting Authority will test samples of this material. For mix design purposes, the amount of asphalt binder in the RAP will be based on extraction tests. The Contractor shall designate the exact proportions of RAP material in the hot mix within the allowable range.

When the work is completed, the Contractor shall return unused material to the stockpile or other designated location, rebuild the stockpile, and restore the area, in accordance with Article 1104.08 of the Standard Specifications.

Test information, if known, will be included in the contract documents.

2. Certified RAP

The RAP must be from a known source and of the proper quality for the intended use, with no material added from other sources during the time in stockpile. The Contractor must certify to this before use. RAP from not more than two known sources at a time will be allowed.

Certified RAP may be used in the base and intermediate course of mixes for which the RAP aggregate qualifies. RAP may also be used in surface courses when

authorized by the Engineer. Not more than 30 percent of the asphalt binder in a final surface course mixture shall come from the RAP.

A certified RAP stockpile shall be sealed or protected in accordance with Materials I.M. 505.

3. Unclassified RAP

Up to 10 percent of unclassified RAP may be incorporated into HMA intermediate mixes for under 3,000,000 ESALs and all base mixes with the following safeguards:

a. Unclassified RAP shall not be used in surface courses.
b. Unclassified RAP shall not be used in intermediate or base mixtures containing designated or certified RAP.
c. The Engineer must inspect the unclassified RAP stockpile visually for uniformity. Unclassified RAP stockpiles containing concrete chunks, grass, dirt, wood, metal, coal tar, or other foreign or environmentally restricted materials shall not be used, unless approved by the Engineer. If foreign material is discovered in any unclassified stockpile, the Engineer may stop the continued use of the pile.
d. Representative samples shall be taken by the Engineer. These samples are to be tested for gradation and asphalt content.
e. No credit will be given for crushed particles.
f. Stockpiles, when used, shall be worked in such a manner that the materials removed are representative of a cross section of the pile as approved by the Engineer.

D. Hot Mix Asphalt Mixture

The surface course is the upper lift for a wearing surface of a designated thickness. The intermediate course is the next lower lift or lifts of a designated thickness. Leveling, strengthening, and wedge courses shall be of the intermediate course mixture. The base course is the lift or lifts placed on a prepared subgrade or subbase.

The job mix formula (JMF) is the percentage of each material, including the asphalt binder, to be used in the HMA mixture. The JMF gradation shall be within the control points specified for the particular mixture designated and shall establish a single percentage of aggregate passing each required sieve size.

If the asphalt binder demand for the combination of aggregates submitted for an acceptable mix design exceeds the basic asphalt binder content by more than 0.75 percent, the mix design will include an economic evaluation prepared by the Contractor. This evaluation will be based on past job mix history, possible aggregate proportion changes, and aggregate availability and haul costs for any changes or substitutions considered.

The basic asphalt binder content is the historical, nominal mixture asphalt binder content, expressed as percent by weight of the asphalt binder in the total mixture. The following values, based on mixture size and aggregate type, shall apply.

BASIC ASPHALT BINDER CONTENT (Percent)

Mixture Size	Aggregate Type	1 inch	3/4 inch	1/2 inch	3/8 inch
Intermediate and Surface	A	4.75	5.50	6.00	6.00
Intermediate and Surface	B	5.25	5.75	6.00	6.25
Base	B	5.25	6.00	6.00	6.25

The Engineer may approve the substitution of any mixture which meets requirements for a higher mixture than specified in the contract documents at no additional cost to the Contracting Authority.

The Contractor shall prepare gyratory HMA mixture designs for all base, intermediate, and surface mixtures. The gyratory design procedure used shall follow the procedure outlined in IM-510 "Method of Design of Asphaltic Concrete Mixes" The gyratory mixture designs submitted shall comply with the following criteria.

DESIGN ESALs (million)	LAYER	COMPACTION LEVELS			REQUIRED DENSITY (percent of Gmm)			VFA (1)	FILM THICK (microns)	F:B
		N-ini	N-des	N-max	N-ini (max)	N-des(target) [air voids]	N-max (max)			
< 0.1	All	7	68	104	92.5	97.0 [3.0]	98.5	75-85	8-13	0.6-1.4
0.1 – 0.3	Surface Inter Base	7	68	104	92.0 92.0 92.5	96.5 [3.5] 96.5 [3.5] 97.0 [3.0]	98.0 98.0 98.5	70-80 70-80 75-85	8-13	0.6-1.4
0.3 – 1.0	Surface Inter base	7	76	117	90.5 90.5 92.0	96.0 [4.0] 96.0 [4.0] 96.5 [3.5]	98.0	65-78 65-78 70-80	8-15	0.6-1.4

(1) VFA is recommended criteria, but not required for mix design approval

Mix Size	3/8 inch	1/2 inch	3/4 inch	1 inch
Minimum VMA (%)	15.0	14.0	13.0	12.0

The gyratory compactor used for design and field control shall meet the AASHTO PP 38 protocol. Compactors for which compliance with this protocol is pending may be used at the discretion of the Transportation Center Materials Engineer.

The HMA mixture designed shall meet gyratory design and mixture criteria corresponding to the size of the mixture and the 20 year design traffic level (ESALs) for the project or an appropriate design level as specified in the contract documents.

E. Other Materials

1. Tack Coat

Tack coat may be SS-1, SS-1H, CSS-1, or CSS-1H. Mixing of CSS and SS grades will not be permitted. RC-70 and MC-70 may also be used after October 1, at the Contractor's option.

2. Hydrated Lime

Hydrated lime shall meet the requirements of AASHTO M 17, except that the gradation shall be determined in accordance with AASHTO T 11. Section 4193 of the Standard Specifications shall not apply. Hydrated lime will not be considered part of the aggregate when determining the job mix formula and the filler/bitumen ratio.

If more than 50 percent of the total (virgin and RAP) aggregates is quartzite, granite, or other siliceous aggregates (not limestone or dolomite) which is obtained by crushing from ledge rock, hydrated lime will be required in the affected surface mixtures for routes over 300,000 ESALs.

Hydrated lime will not be required for base repair, patching, or temporary pavement.

When hydrated lime is required based on aggregate source, the Contractor may arrange for moisture sensitivity evaluation of the proposed HMA mixture design according to AASHTO T 283, “Resistance of Compacted Bituminous Mixture to Moisture-Induced Damage.” When results of this evaluation indicate more than 80% tensile strength retained (TSR), hydrated lime will not be required. Confirmation of AASHTO T 283 test results will be completed by the Central Materials Laboratory during placement of the test strip.

3. Sand for Tack Coats

Sand shall meet requirements of Section 4109, Gradation No. 1 of the Standard Specifications.

4. Fabric Reinforcement

Fabric reinforcement shall meet requirements of Article 4196.01, Paragraph D, of the Standard Specifications.

F. Equipment

The Contractor shall provide sufficient equipment of the various types required to produce, place, and compact each layer of HMA mixture as specified.

Equipment shall meet requirements of Section 2001 of the Standard Specifications with the following modifications:

1. Plant Calibration
When the plant is completely assembled and before any mixture is produced, each aggregate feed shall be calibrated throughout an operating range wide enough to cover the proportion of that material required in the job mix formula.

For continuous and drum mixing plants, the asphalt binder metering pump shall be calibrated at the operating temperature and with the outlet under pressure equal to that occurring in normal operations.

Each plant scale and metering system shall be calibrated before work on a contract begins. The Engineer may waive calibration of permanent plant scales when a satisfactory operational history is available. The Engineer may require any scale or metering system to be recalibrated if operations indicate it is necessary.

Calibration curves shall be available in the plant laboratory. New calibration curves shall be made each time there is a change in size or source of any aggregate being used. On all plants, aggregate samples shall be taken in accordance with Materials I.M. 204 to determine that materials are being proportioned in accordance with the specifications.

2. Paver
Article 2001.19 of the Standard Specification shall apply. When placing paved shoulders, spreaders described in Article 2001.13, Paragraph D, of the Standard Specifications, may be used for all but the top lift.

3. Rollers
For initial and intermediate rolling, self-propelled, steel tired, pneumatic tired, or vibratory rollers meeting requirements of Article 2001.05, Paragraphs B, C, or F, of the Standard Specifications shall be used. Their weight or tire pressure may be adjusted when justified by conditions.

For finish rolling, self propelled, steel tired rollers or vibratory rollers in the static mode meeting requirements of Article 2001.05, Paragraphs B or F, of the Standard Specifications, shall be used.

4. Scales
Article 2001.07, Paragraph B, of the Standard Specifications shall apply to all paving operations regardless of the method of measurement.

.03 CONSTRUCTION

A. Surface Preparation
The existing surface shall be cleaned and prepared in accordance with Section 2212 of the Standard Specifications.

1. Maintenance of the Subgrade and Subbase

The Contractor is responsible for the maintenance of the completed subgrade and subbase to the required density, true cross section, and smooth condition, prior to and during subsequent construction activities. If rutting or any other damage occurs to the subgrade or subbase as a result of hauling operations, the Contractor shall immediately repair the subgrade and subbase, and such repair will include, if necessary, removal and replacement at the Contractor's expense.

Should traffic by others authorized to do work on the project be specifically permitted by the Engineer to use loads which exceed the Contractor's self imposed limit, the Contracting Authority will pay repair costs set by the Engineer, representing an increase in cost of repair of damage, if any, caused by such traffic.

2. Tack Coats

Tack coats shall be applied when the entire surface area on which the coat is to be applied is free of moisture. They shall not be applied when the temperature on the surface being covered is less than 25 degrees F.

The Contractor shall place a tack coat on the area to be covered, and unless otherwise directed, the tack coat shall be spread at an undiluted rate of 0.02 to 0.05 gallon per square yard. The tack coat emulsion may be diluted with water to improve application. A light application of sand cover may also be required, but this is anticipated only for excessive application rates, breakdowns, and short sections remaining at the end of a day's run.

On highways being constructed under traffic, safety and convenience to the public without soiling their vehicles shall be a controlling factor. Tack coat shall be adequately cured prior to placement of the HMA. Tack coat applications shall be limited in length, to minimize inconvenience to the public. They shall be kept within the hot mixture placing work area that is controlled by flaggers at each end, and shall be planned so that they will be covered with hot mixture when the work area is opened to traffic at the end of the day's work. If the tack coat surface becomes dirty from weather or traffic, the surface shall be thoroughly cleaned and, if necessary, retacked.

The vertical face of exposed, longitudinal joints shall be tacked as a separate operation, before the adjoining lift is placed, at a rate from 0.10 to 0.15 gallon per square yard. The vertical surfaces of all fixtures, curbs, bridges, or cold mixture with which the hot mixture will come in contact shall be lightly painted or sprayed to facilitate a tight joint with the fresh mixture.

3. Fabric Reinforcement

When fabric reinforcement is required, the locations will be designated in the contract documents. Fabric shall not be placed on a wet or damp surface or when the road surface is less than 50 degrees F. Fiberglass fabric shall be applied only with an adhesive recommended by the manufacturer. Fabrics with an adhesive backing shall

be placed in accordance with the manufacturer's recommendations.

Other fabrics shall be placed with a heavy coat of the asphalt binder grade used in the HMA mixture applied at a rate of 0.20 to 0.25 gallons per square yard and at a temperature between 295 and 315 degrees F.

The fabric reinforcement shall be placed in accordance with the contract documents (full width or individual crack or joint treatment). The fabric shall be placed immediately following the adhesive or asphalt binder placement under the fabric. Placement may be by hand or by a mechanical method specifically designed for this purpose. Precautions shall be taken to avoid wrinkles in the fabric and to insure that air bubbles are removed without breaking the fabric. Wrinkles or folds which cannot be removed by brushing shall be cut and lapped to provide a smooth surface.

Additional adhesive or asphalt binder may be required to produce a tight, bonded surface. When applied full lane width, the minimum transverse and longitudinal lap shall be 12 inches.

The Contractor shall avoid application of the tack coat over longitudinally placed fabric. Traffic shall not be allowed over the fabric during placement and during curing of the adhesive material to avoid damage to the fabric. A light application of HMA mix material may be hand sprinkled on the fabric to prevent damage from necessary equipment traffic.

Fabric that is damaged or soiled prior to *HMA* overlay shall be repaired at no additional cost, when directed by the Engineer. Sanding, at no additional cost, may also be required by the Engineer during this period.

B. Handling, Production, and Delivery

1. Hot Mix Asphalt Plant Operation

The plant operation shall comply with the following requirements:

a. Handling Mineral Aggregate and RAP

The various aggregate products used shall be kept separate, and adequate provisions shall be made to prevent intermingling. Stockpiling and processing shall be handled in a manner that will ensure uniform incorporation of the aggregate into the mix.

The various aggregates shall be separately fed by feeders to the cold elevator in their proper proportions and at a rate to permit correct and uniform temperature control of heating and drying operations.

b. Handling Asphalt Binder

The asphalt binder shall be brought to a temperature of 260 to 330 degrees F before being measured for mixing with the aggregates. The temperature between

these limits may be further regulated according to the characteristics of the mixture, method of proportioning, and viscosity of the binder. Modified asphalt binder should be heated according to the suppliers recommendations.

c. Handling Hydrated Lime

The lime must be accurately proportioned by a method acceptable to the Engineer.

1) Hydrated Lime Added to a Drum Mixer.

The hydrated lime shall be added at the rate of 0.75 percent by weight of the total aggregate (virgin and RAP) for Interstate and primary projects. The hydrated lime shall be added to a drum mixer by one of the following methods:

a) Added to the virgin aggregate on the primary feed belt, as a lime water slurry.
b) Thoroughly mixed with the total combined aggregate if the aggregate contains at least 3 percent total moisture.
c) Added to the Type 2 or Type 3 virgin aggregate in a moist condition, and then mixed with the total combined virgin aggregate.

Alternative methods for mixing must be reviewed and approved by the Engineer. Hydrated lime shall not be introduced directly into a drum mixer by blowing or augering.

2) Hydrated Lime Added to a Batch Plant.

Hydrated lime shall be added at the rate of 0.5 percent by weight of total aggregate (virgin and RAP) for Interstate and primary projects. It shall be introduced to a batch plant by one of the following methods:

a) Placed on the recycle belt which leads directly into the weigh hopper.
b) Added directly into the pugmill.
c) Added directly into the hot aggregate elevator into the hot aggregate stream. In any case, the lime must be introduced prior to the start of the dry mix cycle.

When any of the above methods for a batch plant is used, the hydrated lime will be considered part of the JMF.

d. Production of Hot Mix Asphalt Mixture

The exact proportions of the various materials shall be regulated within the limits specified so as to produce a satisfactory bituminous coating and mixture. The aggregates shall first be mixed dry, then the asphalt binder shall be added. In batch plants, the asphalt binder shall be added in an evenly spread sheet over the full length of the mixer box. In continuous plants, the asphalt binder shall be sprayed evenly into the aggregate by a positive pressure spray within the first 30

percent of the length of the mixer box. In drum mixing plants, the asphalt binder shall be sprayed evenly into the aggregate by a positive pressure spray. Coating aids may be added, subject to approval of the Engineer.

The mixer shall be operated so that the mixture is of consistently uniform temperature and, as discharged from the mixer, will not vary more than 20 degrees F. The temperature of the mixtures shall not exceed 330 degrees F unless approved by the Engineer.

The rate of production shall not exceed the manufacturer's rated capacity of the mixer and shall provide uniform coating. Dry mixing time for batch mixers shall be not less than 5 seconds. Wet mixing time for batch mixers shall be not less than 25 seconds. For continuous mixers, the mixing time shall be at least 30 seconds.

2. Handling and Delivery

All handling and manipulation of the hot mixture from the mixer to the final spread on the road shall be controlled so that a uniform composition is maintained and segregation of coarser particles is minimized. The segregation shall be minimized to the extent that it cannot be visibly observed in the compacted surface. The Contractor shall only apply approved release agents to trucks and equipment as specified in Article 2001.01 of the Standard Specifications.

The mixture temperature shall be sufficient to allow for the specified compaction and density to be attained. HMA shall not be discharged into the paver hopper when its temperature is less than 245 degrees F for a nominal layer thickness of 1 1/2 inches or less and 225 degrees F for a nominal layer thickness of more than 1 1/2 inches.

Except for an unavoidable delay or breakdown, delivery of hot HMA to any individual spreading unit shall be continuous and uniform and at a rate sufficient to provide as continuous an operation of the spreading unit as practical. The paver hopper shall, at all times, be kept sufficiently full to prevent non-uniform flow of the mixture to the screed.

C. Placement

The existing surface and the surface of each layer shall be clean and free from foreign matter when each succeeding layer is placed. Any surface which becomes dirty shall be cleaned by the Contractor and, if necessary, retacked to provide bond with the succeeding course. If bumps or other significant irregularities appear or are evident in the intermediate course or other lower course, they are to be corrected before the final lift is placed.

HMA mixtures shall not be placed on a wet or damp surface and shall not be placed when the temperature of the road surface is less than shown in the table below. The Engineer may further limit placement if, in the Engineer's judgement, other conditions are

detrimental to quality work. HMA mixtures shall not be placed after November 15, except with approval of the Engineer.

ALL BASE AND INTERMEDIATE COURSE LIFTS OF HMA MIXTURES

Nominal Thickness (inches)	Road Surface Temperature, °F
1 1/2	40
2-3	35
Over 3	25

ALL SURFACE COURSE LIFTS OF HMA

Nominal Thickness (inches)	Road Surface Temperature, °F
1	50
1 1/2	45
2 and greater	40

When placing the mixture, the forward speed of the finishing machine shall be slowed as necessary to provide the least amount of stopping.

A wire or string line shall be used to guide the finishing machine and to maintain alignment. Edge alignment irregularities shall be corrected by hand methods immediately after they occur.

The contract documents will show the total thickness to be placed. Spreading of the mixture shall be at such a rate that, when compacted, the layer(s) will be substantially of the thickness and dimensions required to produce the required thickness. The minimum layer thickness is three times the designated mix size. The compacted thickness of the top layer shall not be greater than 3 inches. This restriction shall not apply to HMA shoulders. The maximum compacted thickness of lower layers may exceed 4 inches if it is demonstrated that the thicker layers have satisfactory density. The riding characteristics of the thicker layers shall be within reasonably close conformance to that expected from a 3 inch layer. Each layer shall be completed to full width before succeeding layers are placed.

At the close of each working day, the roadbed shall be free of any construction equipment. The Contractor shall not spread more mixture than can be compacted and finished in daylight hours of the same working day.

While operating on the road surface, use of kerosene, distillate, other petroleum fractions, or other solvents, for cleaning hand tools or for spraying the paver hopper will not be permitted. Containers of cleaning solution shall not be carried on or near the paver. When a solvent is used, the paver shall not be used for at least 5 hours after this cleaning. The Contractor shall be responsible for collecting and removing all cleaning materials and cleaning residue from the project and plant site. The cleaning material and residue shall become the property of the Contractor.

Whenever practicable, all mixtures shall be spread by a finishing machine. Irregular areas may be spread by hand methods. The hot mixture shall be spread uniformly to the desired depth with hot shovels and rakes. Loads shall not be dumped faster than they can be spread properly. Workers shall not stand on the loose mixture while spreading. After spreading, the hot mixture shall be carefully smoothed to remove all segregated coarse aggregate and rake marks. Rakes and lutes used for hand spreading and smoothing shall be of the type designed for use on HMA mixtures.

D. Compaction

Each layer shall be promptly and thoroughly compacted. Mechanical tampers shall be used for areas inaccessible to the rollers.

The overall rolling procedure and compactive effort shall produce a surface free of ridges, marks, or bumps and shall be subject to approval of the Engineer.

There are two classes of compaction, Class I and Class II. Class I compaction is intended for use on most primary and secondary highways. Class II compaction is intended for resurfacing paved shoulders, temporary crossovers, runarounds, and for other situations where Class I is not specified.

For Class I compaction, the roadway density (percent of laboratory density) will be based on the density obtained from the Quality Control Program for that day's mixture.

1. **Class I Compaction**

   a. Class IA Compaction.

   Class IA compaction will be required for intermediate and surface courses for the traffic lanes of Interstate highways, including Interstate-to-Interstate ramps, and primary highways as specified. Compaction shall be a minimum of 96 percent of laboratory density. The average air void level of the roadway density specimens shall not exceed 8.0 percent.

   b. Class IB Compaction.

   Class IB compaction will be required for all Interstate and primary bases and intermediate and surface courses for the traffic lanes of primary highways, and ramps connecting to Interstate and primary highways, when Class IA compaction is not specified. Compaction shall be to a minimum of 95 percent of laboratory density. The average air void level of the roadway density specimens shall not exceed 8.0 percent.

   c. Class IC Compaction.

   Class IC compaction will be required for traffic lanes of secondary highways, HMA base widening, shoulder resurfacing, and any other HMA course when Class IA and IB are not specified. Compaction shall be a minimum of 94 percent

of laboratory density. The average air void level of the roadway density specimens shall not exceed 8.0 percent.

d. Rolling Patterns for Class IA and IB Compaction.
For Class IA compaction at the start of intermediate course placement and for Class IA and Class IB compaction prior to the start of surface course placement, the Contractor shall construct a test strip for the purpose of evaluating properties of the HMA mixtures and for identifying an effective rolling pattern. For multiple lifts using the same mix requiring Class IA compaction, when the thickness of the second lift varies from the first lift by 1 1/2 inches or more, a test strip for the second lift shall be performed. When the contract documents specify both intermediate and surface courses, a surface course test strip shall be placed in lieu of intermediate mix in a section of intermediate course prior to actual surface course placement. This will be paid for at the contract unit price for the surface mix. The test strip shall be applied to each mixture which has a plan quantity of at least 1500 tons.

The quantity of HMA mixture subject to Class IA compaction, produced and placed for test strip production, will be limited to 500 tons for lift thicknesses of 2 inches or less, and 750 tons for lift thicknesses greater than 2 inches. After test strip placement, further mixing and laydown operations will be suspended until the laboratory test results of the plant produced mixture and core densities are available.

Only one test strip will be allowed for each mixture. At the direction of the Engineer, additional test strips may be required if a successful rolling pattern was not established.

Procedures and documentation to be followed during construction of the test strip shall allow the Engineer and the Contractor to verify mixture design and effectiveness of compaction procedures.

The number of density core samples obtained for the test strip will be increased by one and the low core result will not be used in the Quality Index (Q.I.) density formula for payment for the test strip quantity.

2. Class II Compaction
For all rollers, the initial contact with the hot mixture shall be made by the power driven wheels or roll.

The initial rolling shall be done at a temperature so the mixture will compact without excessive distortion. Except on longitudinal joints and super-elevated curves, rolling with the initial roller shall begin at the outer edges of the pavement, and each successive pass shall progress inward toward the center line. Each reverse trip shall lap all but 4 to 6 inches of the previous track. When reversing direction, the initial roller shall stop at an angle with the longitudinal direction.

Following the initial rolling, the layer shall be given an intermediate rolling with a pneumatic tired roller, and before the temperature falls below 225 degrees F. The intermediate roller shall cover the entire area not less than six times. A finish, steel tired roller shall be used to smooth out all marks and roughness in the surface.

Mechanical tampers shall be used for areas inaccessible to the rollers.

3. Joints

Longitudinal joints for courses on resurfacing projects shall be constructed directly above the longitudinal joint in the existing pavement. The offset distance between longitudinal joints in succeeding courses of full depth HMA paving shall be not more than 3 inches. Transverse construction joints in succeeding courses shall be separated by not less than 6 feet. The spreading of hot mixtures along longitudinal joints shall be adjusted to secure complete joint closure and full compression of the mixture with a smooth surface and joint after compaction. At transverse joints, the cold mixture of the layer shall be sawed to a straight line at right angles to the center line so that a full thickness, a true surface, and a vertical edge will be provided.

The Contractor shall provide a 10 foot straightedge for checking transverse joints for smoothness. Variations in the surface at transverse joints, as indicated by the straightedge, shall be corrected by hand methods before compaction.

Suitable paper or burlap should be used under the taper at end-of-day's run transverse joints to prevent adhesion. Sand, dirt, or wood shall not be used for this purpose. Use of wood or metal headers to form the edge of the joint during rolling of the fresh mixture will not be permitted.

When temporary transverse construction joints will be open to traffic for periods greater than 4 weeks, the Contractor may reduce the amount of top size aggregate in the transition taper.

E. Miscellaneous Operations

1. Leveling and Strengthening Courses

The contract documents will show the thickness of the courses to be placed. Strengthening and leveling courses will be placed as indicated in the contract documents. These courses shall be of the same mixture specified for the base or intermediate course.

When the width of any strengthening or leveling layer is 8 feet or more, the layer shall be spread by a finishing machine.

Leveling courses shall be compacted using Class II compaction procedures with a pneumatic roller.

2. Wedge Courses

Wedge courses used to secure desired super-elevation of curves shall be constructed of the base or intermediate mixture, and insofar as possible, shall be spread by a finishing machine. In placing wedge course, the maximum thickness of individual layers, when compacted, shall not exceed 3 inches, and care shall be used to avoid crushing the coarse aggregate. Wedge courses shall be placed to the full width of pavement.

3. Fixtures in the Pavement Surface

All utility accesses, catch basins, valve holes, or other fixtures encountered within the area to be covered by HMA shall be adjusted to conform to the final adjacent finished surface. Unless otherwise indicated in the plans, the Contractor shall have the option of adjusting fixtures between placement of the surface course and the layer preceding the surface course, or adjusting the fixture after placement of the surface course using a composite patch or PCC patch.

PCC and HMA patch material shall conform to the requirements of Section 2529 of the Standard Specifications. Patches shall be of sufficient size to accommodate the structure being adjusted. Patches shall be square in shape and oriented diagonally to the direction of traffic flow. Elevation of the adjusted fixture and patch shall not be higher than or more than 1/4 inch below that of the surrounding pavement surface.

4. Fillets for Intersecting Roads and Driveways

When fillets are designated in the contract documents for driveways to homesteads and commercial establishments and at intersecting roads, the surface adjacent to the pavement being surfaced shall be shaped, cleaned of loose material, and tack coated. On this coated surface, the hot mixture shall be placed and compacted in layers equal to the adjacent layer and extended from the edge of pavement as shown in the plans. Fillets at intersecting roads shall be placed and compacted at the same time as the adjacent layer. Entrance fillets that are 8 feet or wider may be placed as a separate operation. Paving of fillets 8 feet or more in width shall be with a self propelled finishing machine described in Article 2001.19 of the Standard Specifications. The Engineer may approve other equipment for placement of fillets, based on a demonstration of satisfactory results.

.04 QUALITY CONTROL PROGRAM

The Contractor shall be responsible for all aspects of the project, provide quality control management and testing, and maintain the quality characteristics specified.

Quality Management - Asphalt (QM-A) shall apply to contracts with HMA quantities of 5000 tons or greater and all Interstate contracts. The Contractor shall follow the procedures and meet the criteria established in Article 97055.02, of this Supplemental Specification, Section 2521 of the Standard Specifications, Materials I.M. 510 and 511

For contracts with less than 5000 tons the mix design and quality control provisions of Section 2303 of the Standard Specifications shall apply. This directs the responsibility for mix design and quality control to the Engineer, but does not change the mix requirements from gyratory to Marshall (unless specified in the proposal).

"A significant mix change" is defined as a single occurrence of an aggregate interchange of greater than 5 percent, a single occurrence of an asphalt content change greater than 0.2 percent, or any deletion or introduction of a new aggregate into the mix.

A. Mix Design – Job Mix Formula (JMF)

The JMF for each mixture shall be the responsibility of the Contractor.

The Contractor shall submit completed JMF using the computer format of Form 956 to the materials laboratory designated by the Contracting Authority for approval. The Contractor shall submit supporting documentation demonstrating the design process was followed and how the recommended JMF was determined, including an economic evaluation when required. Documentation shall include trial and final proposed aggregate proportions (Form 955) and corresponding gyratory data. The Contractor shall also submit sufficient loose mixture and individual material samples for approval of the design.

The JMF shall be prepared by personnel who are Iowa DOT certified in bituminous mix design.

If the JMF is not satisfactory, the Contractor shall submit another JMF for review. An approved JMF will be required prior to beginning plant production. The Contractor will be charged $500 for each JMF approval requested and performed which exceeds two per mix size, type, and proposal item on any individual project or group of tied projects.

B. Plant Production

The Contractor shall perform the sampling and testing to provide the quality control of the mixture during plant production. Certified Plant Inspection according to Section 2521 of the Standard Specifications will be required. All personnel performing production quality control testing shall be Iowa DOT certified.

Easy and safe access shall be provided to the location in the plant where samples are to be taken.

1. Sampling and Testing

Aggregate gradation control shall be based on cold feed gradation.

The hot HMA mixture shall be sampled, at random, from the roadway, behind the paver, prior to compaction, in accordance with Materials I.M. 322 - Sampling Uncompacted Asphalt Concrete.

Each day's production shall be considered a lot. When the anticipated quantity for the day is 2000 tons or more, that day's production shall be divided into four sublots, the first sublot of each day shall be the first 500 tons produced. The remaining anticipated quantity for the day shall be divided into three sublots of equal size.

When the anticipated quantity for the day is less than 2000 tons, the first daily sublot shall be the first 500 tons produced. Additional daily sublots of 750 tons each will be established for mix production exceeding the first 500 tons.

The maximum number of samples required for a day's production will not exceed four.

Samples shall not be taken from the first 100 tons of mix produced each day or the first 100 tons of mix following a significant mix change.

Each production sample shall be tested as follows:

Two gyratory specimens shall be prepared and compacted in accordance with AASHTO PP28-97 and the results averaged to determine sample results.

Density shall be determined for each specimen in accordance with Materials I.M. 321 - Method of Test for Compacted Density of Asphalt Concrete.

The Contractor's field quality control laboratory compaction shall be used for field density control. The laboratory density for field control will be the bulk specific gravity of compacted mixture (G_{mb}) at N_{design}. Bulk specific gravity at N_{design} will be determined by compacting specimens to N_{max} and back calculating the bulk specific gravity at N_{design}.

The Theoretical Maximum Specific Gravity of the uncompacted mixture shall be determined in accordance with Materials I.M. 350 - Method of Test for Maximum Specific Gravity of Asphalt Paving Mix (Rice Procedure using Erlenmeyer Flask) or other test methods recognized by AASHTO or ASTM.

The laboratory air voids shall be determined in accordance with Materials I.M. 508 - Asphaltic Concrete Plant Inspection and Materials I.M. 510 - Method of Design of Asphalt Concrete Mixes.

2. Production Control

After the JMF is established, the combined aggregate furnished for the project, the quantity of asphalt binder and laboratory air voids should consistently conform to the JMF, as target values, and shall be controlled within the production tolerances given in the table below. Plant production must be controlled such that the plant produced HMA mixture will meet mixture design criteria for Air Voids and VMA at N_{design} gyrations of the gyratory compactor within the single test tolerances given in the table.

The mix design gradation control points for the size mixture designated in the project plans will not apply to plant production control.

Production Tolerances

MEASURED CHARACTERISTIC	TARGET VALUE	SPECIFICATION TOLERANCE
Cold feed gradation No. 4 and larger sieves	by JMF	± 7.0
Cold feed gradation No. 8	by JMF	± 5.0
Cold feed gradation No. 30	by JMF	± 4.0
Cold feed gradation No. 200	by JMF(1)	± 2.0(1)
Daily asphalt binder content	by JMF	± 0.3
Field laboratory air voids	Note 2	-0.5 / +1.0 (3)
VMA (4)	by JMF	± 1.0 (5)

(1)- The dust to binder ratio of the plant produced mixture will be maintained between 0.6 and 1.4.
(2)- As specified for the level of HMA mixture.
(3)- Based on the moving average of four test values
(4)- Restricted to an asphalt film thickness as specified for the level of HMA mixture design.
(5)- Based on the daily lot average

The Contractor shall strive for the target value of the percent air void and asphalt binder by adjusting gradation and asphalt binder content.

The Contractor shall produce a mixture of uniform composition conforming to the JMF. If, during production, the Contractor determines from quality control testing that adjustments are necessary to the JMF to achieve the specified properties, adjustments to the JMF target gradation and asphalt binder content values may be made.

Adjustments to the JMF aggregate proportions and asphalt binder content shall be made as a result of the interactive process between the Contractor and the Engineer. The Contractor's adjustment recommendations shall prevail, provided all specifications and established mix design criteria are being met for plant production.

The voids in the mineral aggregate (VMA) and estimated film thickness shall be measured for specification compliance every day of HMA production.

Quality control charts shall be available and kept current showing both individual test results and moving average values. Moving averages shall be based on four consecutive test results. Control charts shall include a target value and specification tolerances. As a minimum, the following values shall be plotted on Iowa DOT Materials approved control charts as indicated below:

Laboratory density (each point being an average of two specimens).

Laboratory air voids (plotted to nearest 0.1 percent)

Asphalt binder content (plotted to nearest 0.1 percent)

Cold feed gradation (No. 4, No. 8, No. 30, and No. 200 sieves)

Maximum specific gravity (Rice) (Materials I.M. 350).

Laboratory voids for individual tests shall be calculated according to Materials I.M. 510, using the individual density and individual maximum specific gravity determined for each sample. The moving average of laboratory voids shall be the average of the last four individual laboratory voids.

The Contractor shall monitor the test results and to make mix adjustments, when appropriate, to keep the mixture near the target values. The Contractor shall notify the Engineer whenever the process approaches a specification tolerance limit. One moving average point for laboratory air voids outside the specification tolerance limit shall be cause to cease operations. The Contractor shall assume the responsibility to cease operations, including not incorporating produced material which has not been placed. The process shall not be started again until the Contractor notifies the Engineer of the corrective action proposed.

C. Construction

1. Density

Density samples shall be taken from the compacted mixture and tested not later than the next working day following placement and compaction.

A lot shall be considered as one layer of one mixture placed during a day's operation. The Engineer may approve classifying multiple layers of construction placed during a single day as a lot provided only one mixture was used. When the day's operation is 2500 square yards or less, or the day's operation is 500 tons or less, or when the mixture is being placed in irregular areas, or for wedge, leveling, or strengthening courses, the Engineer may waive sampling for density provided compaction has been thorough and effective.

Seven density samples will be taken for each lot. The length laid in each lot shall be divided into seven approximately equal sections and one sample will be obtained at a random location in each section.

If a sample is damaged or measures less than 70 percent or more than 150 percent of the intended thickness, an alternate sampling location will be determined and used. Samples shall not be taken less than 1 foot from the edge of a given pass of the placing equipment or from run-outs or areas adjacent to day's work joints or structures.

The quality index for density of each lot shall be determined by the following formula:

$$QI_{DENSITY} = \frac{(\text{Average } G_{mb})_{FIELD\ LOT} - ((\%\text{Density})_{SPECIFIED} \times (\text{Average } G_{mb})_{LAB\ LOT})}{(\text{Std Dev } G_{mb})_{FIELD\ LOT}}$$

where G_{mb} = bulk Specific Gravity of the mixture

When the quality index falls below 0.00, the Engineer may declare the lot or parts of the lot defective.

If one of the density test values from a lot is an outlier, identified in accordance with the procedure described in Materials I.M. 508, the outlier value shall not be used to determine the quality index. The quality index shall be determined using the remaining density test values.

If only one laboratory density value is obtained that day, combine that value with the next day's test results to evaluate both days' production. If two or more laboratory density values are obtained that day, then the average of those tests alone shall be used. If a significant mix change has been made, only the appropriate laboratory density values should be used with the corresponding density cores.

2. Thickness

The thickness of the completed course will be measured to the nearest 1/8 inch, exclusive of seal coat, by measurement of cores. All areas of uniform and similar thickness and width for the project will be divided into lots.

The frequency specified for taking density samples from the surface lift will be used when measuring for completed thickness. However, samples that may not be tested for density because they are less than 70 percent of the intended thickness shall be used for thickness, and in these particular instances, the additional samples of sufficient thickness that are used for density tests shall not be measured for thickness. Thickness samples will be taken full depth of the completed course and after measurement, the density samples for the top layer shall be removed by the Contractor from the core. If any of the measurements for a lot is less than the

designated thickness, the quality index for thickness of that lot will be determined by the following formula:

$$QI_{THICKNESS} = \frac{\text{Average Thickness}_{MEASURED} - (\text{Thickness}_{PLAN} - 0.50)}{\text{Maximum Thickness}_{MEASURED} - \text{Minimum Thickness}_{MEASURED}}$$

When the day's operation is 2500 square yards or less, or the mixture is being placed in irregular areas or next to structures, the Engineer may waive sampling for thickness provided there is reasonable assurance that the pavement conforms to the required thickness. When the quality index falls below 0.00, the Engineer may declare the lot or parts of the lot defective.

D. Sampling and Testing

The Contractor shall calibrate and correlate the testing equipment with prescribed procedures. Sampling and testing shall conform with specified testing procedures as listed in the Materials I.M. and applicable Specifications. When the results from a lab are used for product acceptance, the lab shall be qualified.

All samples shall be identified, stored and retained by the Contractor for the Contracting Authority until the lot is accepted. The Contracting Authority may acquire these samples for comparative, verification, or assurance testing.

All samples shall be identified by a system approved by the Engineer.

1. Loose Material Requirements

All samples of asphalt binder and tack coat material, shall be identified and promptly delivered to the appropriate laboratory, as designated by the Engineer.

Samples of loose HMA mixture shall be taken behind the paver, weigh at least 50 pounds, and shall be transported to the test facility in a way to retain heat to facilitate sample splitting procedures. The tests for mixture properties shall be conducted on representative portions of the mix, split from the larger sample of mix. After splitting of the sample is completed in the Contractor's QM-A laboratory, the remainder of the sample (approximately 30 pounds) shall be retained for laboratory testing by the laboratory designated by the Contracting Authority.

When requested by the Engineer, normally once per day, an additional box sample, (50 pounds) will be required for correlation and validation testing.

Samples shall be split in accordance with Materials I.M. 357 - Preparation of Bituminous Mix Samples for Test.

All test results and calculations shall be recorded and documented on data sheets approved by the Contracting Authority. Specific test results shall be recorded on a daily summary sheet approved by the Contracting Authority. The Daily Quality Control Summary Sheet shall also include a description of quality control actions

taken (adjustment of cold feed percentages, changes in JMF, etc.). The Contractor shall FAX (or by other method approved by the Engineer) the daily quality control summary sheet to the appropriate Iowa DOT Transportation Center Materials Engineer or Engineer designated by the Contracting Authority daily. A copy of the electronic file containing project information generated during the progress of the work shall be furnished to the Engineer at project completion.

2. Finished Pavement Requirements

The Contractor shall cut samples from any course or finished pavement for tests of density, thickness, or composition, by sawing with a power driven masonry saw or by drilling a minimum 4 inch nominal diameter core. The surfaces shall be restored by the Contractor the same day. The core holes shall be dried, filled with the same type of material, and the material properly compacted. Pavement core samples shall be identified and delivered to the Contractor's quality control field laboratory.

The compacted HMA pavement shall be tested by Contractor's personnel who are Iowa DOT Certified in QM-A bituminous quality control.

The minimum number of cores taken shall be in accordance with the following Materials I.M.s:

Materials I.M. 204 - Inspection of Construction Projects - Appendix A-V.
Materials I.M. 204 Supplement - Inspection Sampling Guide.

The core locations will be determined by the Engineer in accordance with Construction Manual Section 8.13-B - Compacted Asphalt Concrete Samples.

The cores shall be prepared and tested in accordance with the following Materials I.M.s:

Materials I.M. 320 - Sampling Compacted Pavement Layers.
Materials I.M. 321 - Compacted Density of Asphalt Concrete.
Materials I.M. 337 - Method of Determining Thickness of Completed Course of Base, Subbase, and Asphaltic Concrete.

3. Acceptance, Correlation, and Quality Assurance Testing

The Contractor's quality control test results will be compared and correlated to the Engineer's test results on a regular basis using guidelines and tolerances set forth in the following Materials I.M.s:

Materials I.M. 208 - Appendix C. InterLaboratory Correlation Testing
Materials I.M. 216 - Guidelines for Verifying Certified Testing Results.
Materials I.M. 511 - Control of Asphaltic Concrete Mixtures for Projects.

If satisfactory correlation exists between the Contractor's test results and the Engineer tests, the Contractor's results will be used. Disputes between the Contractor's and

Engineer's test results, on one sample or one test of one sample, will be resolved by repeated testing of the same sample or additional testing of another sample. When repeated and/or additional sampling fails to resolve a dispute, a third materials laboratory designated by the Contracting Authority will act as a reference laboratory and perform additional testing as necessary to resolve the dispute.

The Engineer will select, at random, a split portion of one or more of the daily hot mix production samples. Some or all of the samples selected will be tested in the materials laboratory designated by the Engineer. The Engineer will test as many of the samples as necessary to establish a correlation.

The Engineer will select one daily set of cores at random each week. These will be tested at the materials laboratory designated by the Engineer. Cores from the initial production will also be tested by the Contractor and the Engineer for correlation and validation of results.

.05 METHOD OF MEASUREMENT

The Engineer will measure the quantities of the various items of work involved in placement of bituminous mixtures in accordance with the following provisions:

A. Hot Mix Asphalt Mixture

1. Measurement by Weight.
When measurement is by weight, the quantity of mixture will be expressed in tons and determined from the weight of individual loads measured to the nearest 0.01 tons. Loads may be weighed in trucks, weigh hoppers, or from the weight from batch plants computed by count of batches in each truck and batch weight. Article 2001.07 of the Standard Specifications applies. The weights of various loads shall be segregated into the quantities for each pay item.

2. Measurement by Area.
When payment is based on square yards, the area of each lot will be computed to the nearest 0.1 square yard from surface dimensions measured to the nearest 0.1 foot. When the average measured width of the lot is equal to or greater than the plan width, the computed area will be based on the plan width. When the average measured width is less than plan width, the computed area will be based on the measured width.

When constructing shoulders on a basis of payment of square yards, inspection of the profile and elevation will be based on the completed work relative to the pavement edge; the Contractor shall be responsible for the profile and elevation of the subgrade and for thickness.

B. Asphalt Binder
The amount of asphalt binder used from batch plants, continuous plants, or drum mixing plants, shall be by stick measurement in the Contractor's storage tank or by in-line flow

meter reading. The asphalt binder quantity added to the storage tank shall be computed from a supplier certified transport ticket accompanying each load. The quantity of asphalt binder not used in the work will be deducted.

When the quantity of asphalt binder in a batch is measured by weight and is separately identified by automatic or semi-automatic printout, the Engineer may compute from this printout the quantity of asphalt binder used.

By mutual agreement, this method may be modified when small quantities or intermittent operations are involved.

The Engineer will calculate and exclude the quantity of asphalt binder used in mixtures in excess of the tolerance specified in Article 97055.04, Paragraph B(2), of this Supplemental Specification.

When payment for HMA is based on area, the quantity of asphalt binder used will not be measured separately for payment.

C. Recycled Asphalt Pavement

The quantity of asphalt binder in Recycled Asphalt Pavement (RAP), which is incorporated into the mix, will be calculated in tons of asphalt binder in the RAP, based on an assumed asphalt binder content of five percent of the dry RAP weight.

The quantity of asphalt binder in RAP, which is incorporated into the mix, will be included in the quantity of asphalt binder used.

The quantity of asphalt binder in unclassified RAP will not be measured for payment.

D. Hydrated Lime

Hydrated lime incorporated in HMA mixtures will be considered incidental to HMA and will not be measured.

E. Tack Coat

Tack Coat will be considered incidental to HMA, and will not be measured separately.

F. Fabric Reinforcement

The Engineer will calculate to the nearest 0.1 square yards on the roadway surface dimensions measured to the nearest 0.1 foot for the fabric reinforcement placed in acceptable condition.

G. Adjustment of Fixtures

The Engineer will count the number of fixtures adjusted to the finished grade.

H. Hot Mix Asphalt Pavement Samples

HMA Pavement Samples of any finished pavement furnished according to Article 97055.04 Paragraph D, of this Supplemental Specification, or required elsewhere in the contract documents, will not be individually counted for payment.

.06 BASIS OF PAYMENT

The costs of designing, producing, placing, and testing bituminous mixtures and the cost of furnishing and equipping the QM-A field laboratory shall not be paid for separately, but shall be included in the contract unit price for the HMA mixes used. The application of hydrated lime, tack coat, and sand cover aggregate are incidental and will not be paid for separately. Any pollution control testing shall be at the Contractor's expense.

A. Hot Mix Asphalt Mixture

For the quantity of each class and category of mixture, including fillets, the Contractor will be paid the respective contract unit price. Payment will be adjusted by the following percentages for the quality index for density determined for the lot:

Quality Index (Density) 7 Samples [(1)]	Percent of Full Payment
greater than 0.72	100
0.40 to 0.72	95
0.00 to 0.39	85
less than 0.00	75 Maximum

[(1)] Or 6 samples and 1 outlier (Only one outlier will be allowed).

When the basis of payment is by area, payment will be further adjusted by the appropriate percentage according to the quality index for thickness determined for that lot and the following table:

Quality Index (Thickness) 7 Samples	Percent of Payment (Previously Adjusted for Density)
greater than 0.34	100
0.14 to 0.34	95
0.00 to 0.13	85
less than 0.00	75 Maximum

Courses for which quality index (thickness) is not determined because of size or shape, and courses which are found to be deficient in average width, will be paid for according to Article 1105.04 of the Standard Specifications.

B. Asphalt Binder

For the number of tons of asphalt binder used in the work, measured as provided in Article 97055.25, Paragraph B, of this Supplemental Specification, the Contractor will be paid the contract unit price per ton.

Payment for asphalt binder will be for all new asphalt binder and the asphalt binder in RAP salvaged from the project, the Contracting Authority owned stockpile, or certified Contractor owned stockpiles, which is incorporated in the mixture.

When scarification of asphalt material is required and is paid for on the basis of square yards and no other use of the RAP is specified, the RAP shall become the property of the Contractor, and the Contractor shall not be charged for the asphalt binder in that material.

When the basis of payment for HMA is in square yards, compensation for asphalt binder will be included in the contract unit price per square yard.

C. Recycled Asphalt Pavement
RAP which is owned by the Contracting Authority will be made available to the Contractor for the recycled mixture at no cost to the Contractor other than loading, hauling, and processing as required for incorporation into the mix.

D. Fabric Reinforcement
For the number of square yards of fabric reinforcement installed, the Contractor will be paid the contract unit price. This payment shall be full compensation for furnishing all materials, labor, and equipment necessary for installing the fabric as required, including the adhesive or heavy tack coat of asphalt binder used as the adhesive.

E. Adjustment of Fixtures
For the number of fixtures adjusted to the finished grade line, the Contractor will be paid the contract unit price for each. If the contract contains no price for adjustment of fixtures, this work will be paid for as extra work as provided in Article 1109.03, Paragraph B of the Standard Specifications.

F. Hot Mix Asphalt **Pavement Samples**
For cutting HMA pavement samples to determine density or thickness according to the specifications, when either of these is the responsibility of the Contractor, and elsewhere when required by the contract documents, the Contractor will be paid the lump sum contract price. This lump sum payment shall be full compensation for furnishing all such samples for all courses or items of work, and for delivery of samples as specified in Article 97055.04, Paragraph D, of this Supplemental Specification.